Small Business Innovation Research/Small Business Tech Transfer

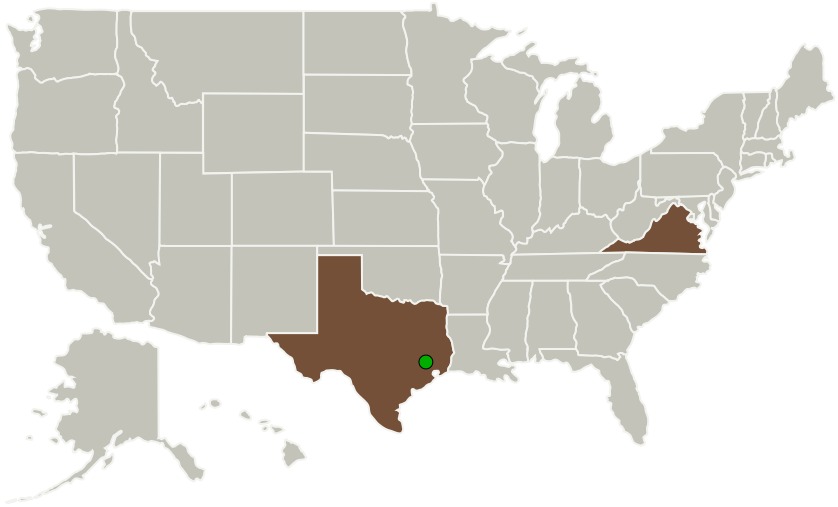
Integrated Structural Health Sensors for Inflatable Space Habitats, Phase II

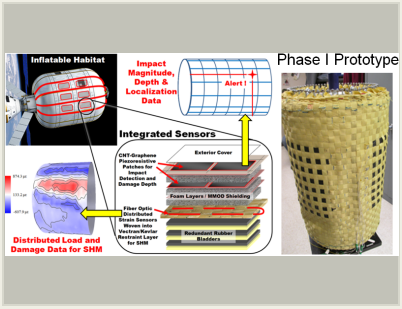
Completed Technology Project (2017 - 2019)

Project Introduction

Luna proposes to continue development of integrated high-definition fiber optic sensors (HD-FOS) and carbon nanotube (CNT)-graphene piezoresistive sensors for inflatable space habitat materials to enable full coverage structural health monitoring (SHM) and impact detection. Inflatable habitats are key to reducing the weight of space structures, enabling future long term missions and planetary habitation. There is a need for monitoring the structural health of these habitats, as many of the methods used on earth are not applicable to the space environment or the materials used. To accomplish this goal, Luna has teamed with Embry-Riddle Aeronautical University (ERAU) who is a leader in the development of CNT sensor technology. Luna is teaming with an established manufacturer to fabricate a sub-scale inflatable structure with integrated SHM sensors which will enable thorough characterization of the approach. During Phase I, the team successfully demonstrated damage detection in an inflatable prototype as well as dynamic impact detection of soft goods layers with the technologies. Phase II will focus on increasing the TRL of the sensing technologies and preparing for transition into future NASA missions. Phase III will focus on commercializing the technology with NASA and NASA affiliates.

Primary U.S. Work Locations and Key Partners





Integrated Structural Health Sensors for Inflatable Space Habitats, Phase II Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Texas	Virginia

Project Transitions

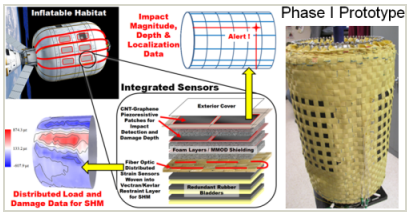
April 2017: Project Start

August 2019: Closed out

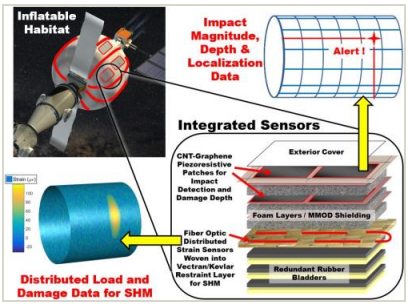
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141064)*

Images



Briefing Chart Image
Integrated Structural Health Sensors for Inflatable Space Habitats, Phase II Briefing Chart Image
(https://techport.nasa.gov/image/130020)



Final Summary Chart Image
Integrated Structural Health Sensors for Inflatable Space Habitats, Phase II
(https://techport.nasa.gov/image/125897)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Luna Innovations, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

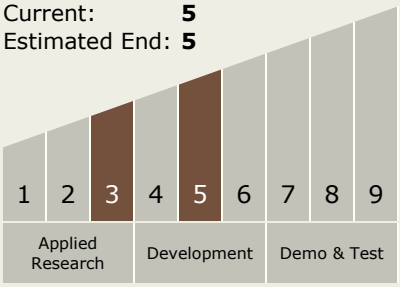
Carlos Torrez

Principal Investigator:

Daniel Kominsky

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.4 Habitation Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System